

700 MHz, -3 dB Bandwidth; Single SPDT Analog Switch

DESCRIPTION

DG3257 is a low R_{ON} , high bandwidth analog switch configured in single SPDT. It achieves $5\ \Omega$ switch on resistance, greater than 700 MHz -3 dB bandwidth with 5 pF load, and a channel to channel crosstalk at -32 dB and isolation at -33 dB. Fabricated with high density sub micro CMOS process, the DG3257 provides low parasitic capacitance, handles bidirectional signal flow with minimized phase distortion. Guaranteed 1.4 V logic high threshold makes it possible to interface directly with low voltage MCUs.

The DG3257 is designed for a wide range of operating voltages from 1.65 V to 5.5 V that can be driven directly from one cell Li-ion battery. On-chip protection circuit protects against fault events when $V+$ goes zero. Latch up current is 300 mA, as per JESD78, and its ESD tolerance exceeds 6 kV.

Packaged in ultra small μ DFN6L (1 mm x 1 mm), it is ideal for portable high speed mix signal switching application.

As a committed partner to the community and the environment, Vishay Siliconix manufactures this product with lead (Pb)-free device termination.

The μ DFN6L package has a nickel-palladium-gold device termination and is represented by the lead (Pb)-free “-GE4” suffix to the ordering part number. The nickel-palladium-gold device terminations meet all JEDEC® standards for reflow and MSL rating. As a further sign of Vishay Siliconix’s commitment, the DG3257 is fully RoHS-compliant.

FEATURES

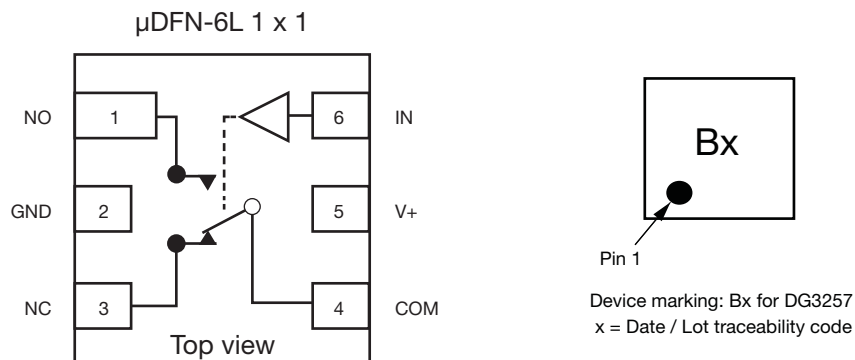
- 1.65 V to 5.5 V single supply operation
- Low resistance: $5\ \Omega$ /typ. at 4.2 V
- Switch ON capacitance: 9 pF typical
- -3 dB bandwidth: 700 MHz
- Power down protection
- Signal swing over $V+$ capable (when signal swing over $V+$, signal pin current: typically $(V_S - 0.6\ V)/120\ \Omega$)
- Control logic S pin voltage can go beyond $V+$
- Break before make switching
- Latch up current: 300 mA (JESD78)
- ESD / HBM: 6 kV,
- ESD / CDM: 1 kV
- TTL/CMOS compatible
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT

APPLICATIONS

- Smart phones
- Tablet, e-readers
- Camera, audio devices
- Computer and peripherals
- Data storage
- IoT
- Wearable
- Portable healthcare

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION



| ORDERING INFORMATION | | |
|----------------------|--------------|-----------------|
| TEMP. RANGE | PACKAGE | PART NUMBER |
| -40 °C to +85 °C | μ DFN-6L | DG3257DN-T1-GE4 |



| TRUTH TABLE | | |
|-------------|-----|-----|
| IN | NC | NO |
| 0 | ON | OFF |
| 1 | OFF | ON |

| PIN DESCRIPTIONS | |
|------------------|------------------------|
| PIN NAME | DESCRIPTION |
| IN | Logic select Input |
| V+ | Power pin |
| GND | Power ground pin |
| NC | Normal close data port |
| NO | Normal open data port |
| COM | Common data port |

| ABSOLUTE MAXIMUM RATINGS (T _A = 25 °C, unless otherwise noted) | | | |
|---|---------------------------------|-------------|------|
| PARAMETER | CONDITIONS | LIMITS | UNIT |
| V+, S | Reference to GND | -0.3 to +6 | V |
| COM, NO, NC | Reference to GND | -0.3 to +6 | |
| Maximum continuous switch current | | ± 50 | mA |
| Maximum pulse switch current | Pulsed at 1 ms, 10 % duty cycle | ± 100 | |
| Thermal resistance | | 407 | °C/W |
| ESD / HBM | EIA / JESD22-A114-A | 6000 | V |
| ESD / CDM | EIA / JESD22-C101A | 1000 | |
| Temperature | | | |
| Operating temperature | | -40 to +85 | °C |
| Max. operating junction temperature | | 150 | |
| Operating junction temperature | | 125 | |
| Storage temperature | | -65 to +150 | |

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

| SPECIFICATIONS | | | | | | |
|----------------------------|-------------------------------------|---|----------|---------------------|-----------------------------|------|
| PARAMETER | SYMBOL | TEST CONDITIONS V ₊ = 3 V, V _{INH} = 1.3 V, V _{INL} = 0.5 V OTHERWISE UNLESS SPECIFIED | +25 °C | -40 °C to +85 °C | TYP. ^a / MAX. | UNIT |
| Analog Switch | | | | | | |
| Analog signal range | V _{ANALOG} | | 0 to 5.5 | | | V |
| Drain-source on-resistance | R _{DS(on)} | V ₊ = 1.8 V, V _{NC/NO} = 0 V to V ₊ , I _{S±} = 8 mA | 28 | - | Typ. | Ω |
| | | | 47 | 54 | Max. | |
| | | V ₊ = 3 V, V _{NC/NO} = 0.4 V, I _{S±} = 8 mA | 7 | - | Typ. | |
| | | | 8 | 9 | Max. | |
| | | V ₊ = 3.6 V, V _{NC/NO} = 0.4 V, I _{S±} = 8 mA | 6 | - | Typ. | |
| | | | 7 | 8 | Max. | |
| | | V ₊ = 4.2 V, V _{NC/NO} = 0.4 V, I _{S±} = 8 mA | 5 | - | Typ. | |
| | | | 6 | 7 | Max. | |
| | | V ₊ = 5 V, V _{NC/NO} = 0.4 V, I _{S±} = 8 mA | 5 | - | Typ. | |
| | | | 5.5 | 6 | Max. | |
| On-resistance flatness | R _{flat(on)} | V ₊ = 3 V, V _{NC/NO} = 0 V, 1 V, I _{S±} = 8 mA | 2 | - | Typ. | |
| | | | 3 | 6 | Max. | |
| On-resistance matching | ΔR _{DS(on)} | V ₊ = 2.7 V to 5.5 V, V _S = 0 V to V ₊ , I _{S±} = 8 mA | 0.4 | - | Typ. | |
| | | | 0.6 | 0.8 | Max. | |
| Switch off leakage current | I _S /I _{d(off)} | V ₊ = 5.5 V, V _{COM} = 1 V / 4.5 V, V _{NC/NO} = 4.5 V / 1 V | ± 0.2 | - | Typ. | nA |
| | | | - | ± 20 | Max. | |
| Channel on leakage current | I _{d(on)} | V ₊ = 5.5 V, V _{COM} = 1 V / 4.5 V, V _{NC/NO} = open | ± 0.2 | - | Typ. | |
| | | | - | ± 20 | Max. | |
| Power down leakage | I _{COM(PD)} | V ₊ = 0 V, V _{COM} = 4.5 V | 1 | - | Max. | μA |

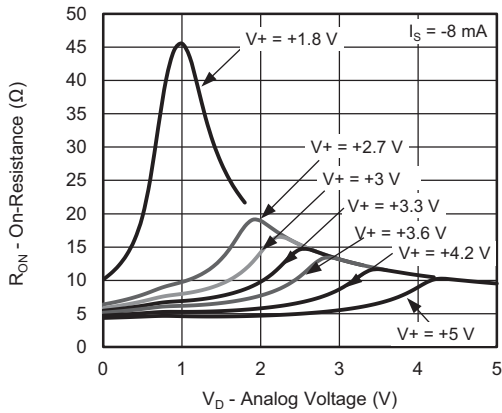


| SPECIFICATIONS | | | | | | | |
|--|---------|---|-------------------------------------|---------------------|-----------------------------|------|----|
| PARAMETER | SYMBOL | TEST CONDITIONS V+ = 3 V, VINH = 1.3 V, VINL = 0.5 V OTHERWISE UNLESS SPECIFIED | +25 °C | -40 °C to +85 °C | TYP. ^a / MAX. | UNIT | |
| Digital Control | | | | | | | |
| Input voltage high | VINH | V+ = 3 V | - | 1.2 | Min. | V | |
| | | V+ = 5 V | - | 1.4 | Min. | | |
| Input voltage low | VINL | V+ = 3 V | - | 0.45 | Max. | | |
| | | V+ = 5 V | - | 0.5 | Max. | | |
| Input leakage | IIN | V+ = 0 V, 5.5 V, VIN = VGND or V+ | 0.001 | - | Typ. | µA | |
| | | | - | 0.23 | Max. | | |
| Digital input capacitance | CIN | | 5.6 | - | Typ. | pF | |
| Dynamic Characteristics | | | | | | | |
| Break-before-make-time | tOPEN | VNO = VNC = 1.5 V; RL = 300 Ω, CL = 35 pF | 6 | - | Typ. | ns | |
| | | | - | 2 | Min. | | |
| Turn-on time | tON | VNC = VNO = V+; RL = 50 Ω, CL = 35 pF | 17 | - | Typ. | | |
| | | | 40 | 50 | Max. | | |
| Turn-off time | tOFF | | 9 | - | Typ. | | |
| | | | 35 | 45 | Max. | | |
| Propagation delay ^b | tPD | | | 100 | - | Typ. | ps |
| Charge injection ^b | QINJ | | CL = 1 nF, RGEN = 0 Ω, VCOM = 1.5 V | 4 | - | Typ. | pC |
| Off-isolation ^b | OIRR | RL = 50 Ω, CL = 5 pF, f = 240 MHz | -33 | - | Typ. | dB | |
| Crosstalk ^b | XTALK | | -32 | - | Typ. | | |
| Insertion loss ^b | | RL = 50 Ω, CL = 5 pF, f = 1 MHz | -0.62 | - | Typ. | | |
| Total harmonic distortion + Noise ^b | THD + N | RL = 600 Ω, VPP = 0.5 Vp-p, f = 20 Hz to 20 kHz | 0.025 | - | Typ. | % | |
| Bandwidth, -3 dB ^b | BW | RL = 50 Ω, CL = 5 pF | 714 | - | Typ. | MHz | |
| Source off capacitance ^b | CS(off) | f = 240 MHz | 3 | - | Typ. | pF | |
| Drain on capacitance ^b | CD(on) | | 9 | - | Typ. | | |
| Power Requirements | | | | | | | |
| Power supply range | | GND = 0 V | +1.65 / +5.5 min. / max. | | | V | |
| Power supply current | I+ | Digital Inputs 0 V or V+, V+ = 2.7 V to 5.5 V | 0.001 | - | Typ. | µA | |
| | | | - | 0.4 | Max. | | |
| | | Digital inputs 1.8 V, V+ = 3 V | 1 | - | Typ. | | |
| | | | - | 1.5 | Max. | | |

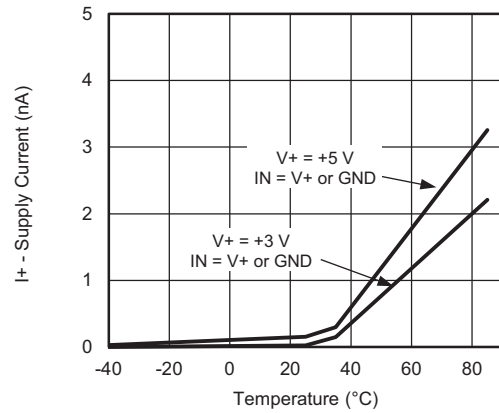
Notes

- a. Typical values are for design aid only, not guaranteed nor subject to production testing.
- b. Guarantee by design, not subjected to production test.

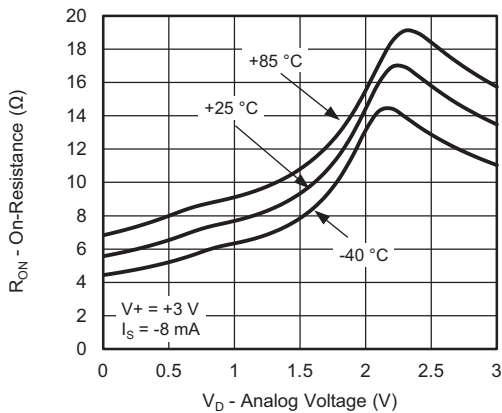
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



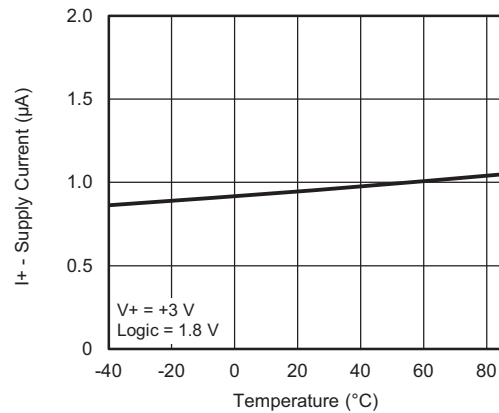
RON vs. V_D and Single Supply Voltage



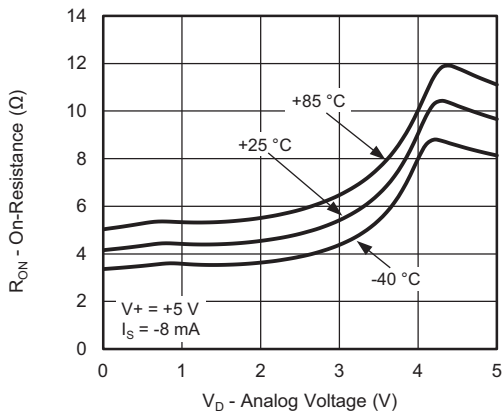
Supply Current vs. Temperature



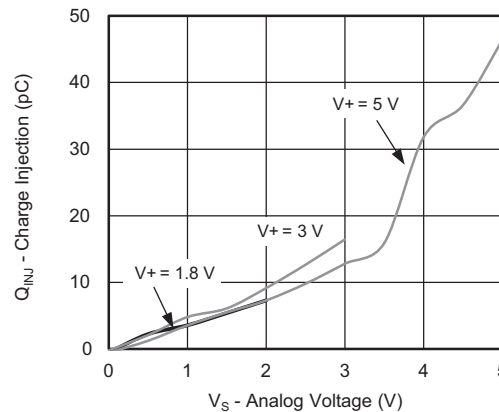
RON vs. Analog Voltage and Temperature



Supply Current vs. Temperature

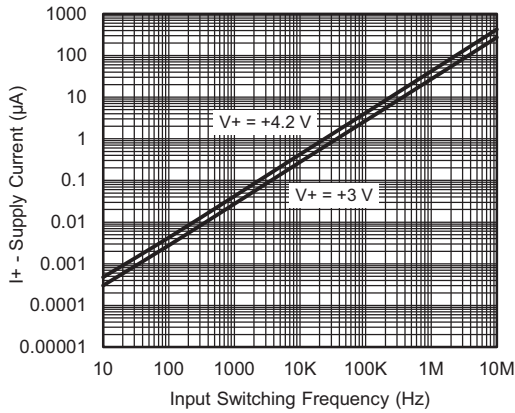


RON vs. Analog Voltage and Temperature

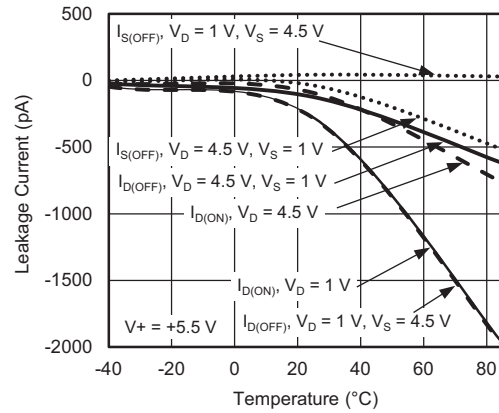


Charge Injection vs. Analog Voltage

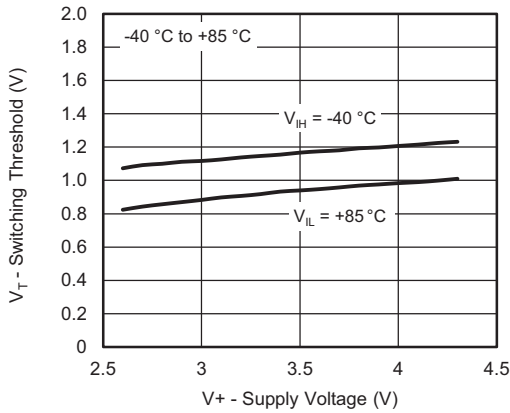
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



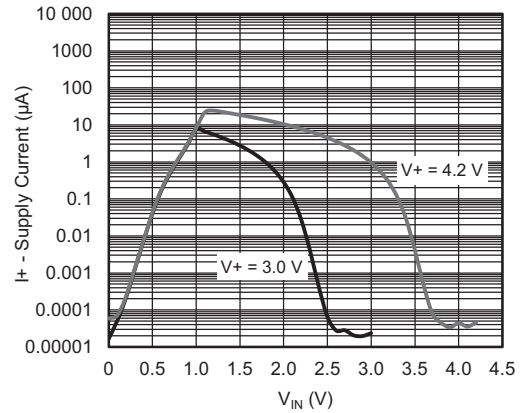
Supply Current vs. Input Switching Frequency



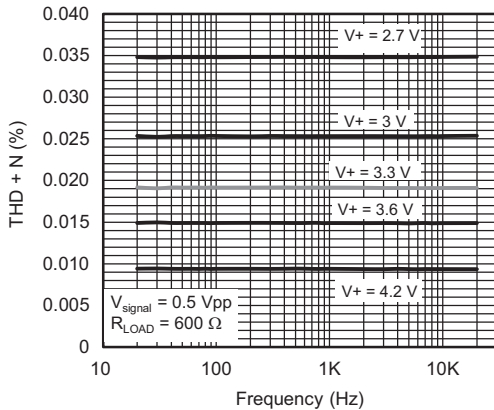
Leakage Current vs. Temperature



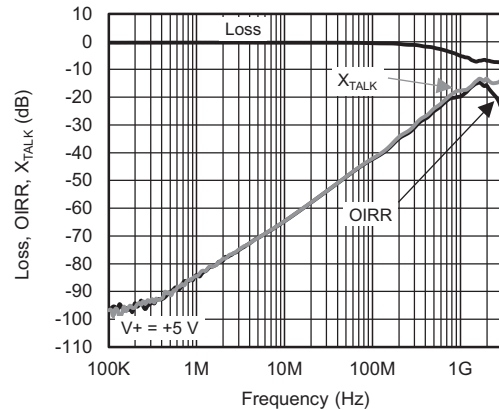
Switching Threshold vs. Supply Voltage



Supply Current vs. V_{IN}

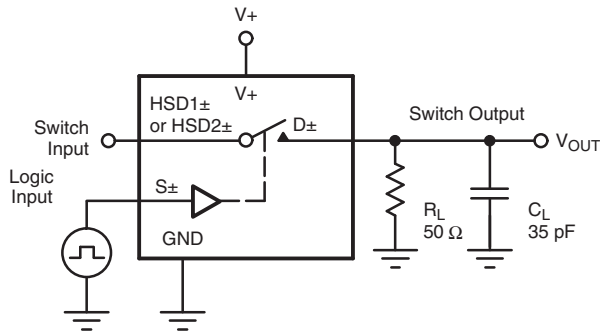


THD + N vs. Frequency



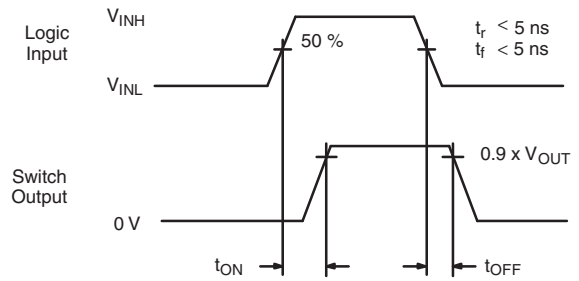
X_{TALK} , $V+ = 5\text{ V}$

TEST CIRCUITS



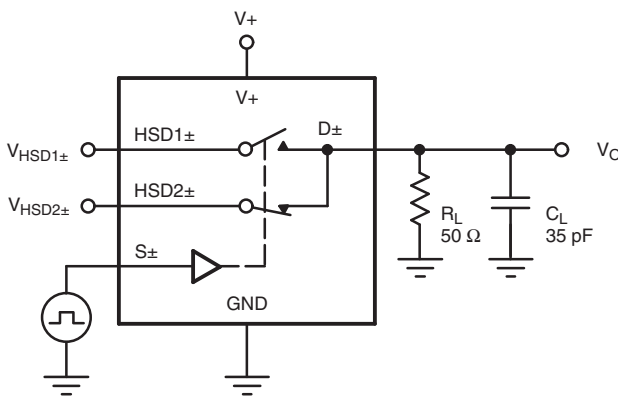
C_L (includes fixture and stray capacitance)

$$V_{OUT} = D_{\pm} \left(\frac{R_L}{R_L + R_{ON}} \right)$$



Logic "1" = Switch on
Logic input waveforms inverted for switches that have the opposite logic sense.

Fig. 1 - Switching Time



C_L (includes fixture and stray capacitance)

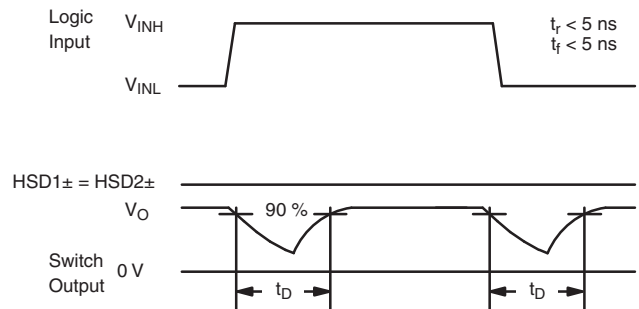
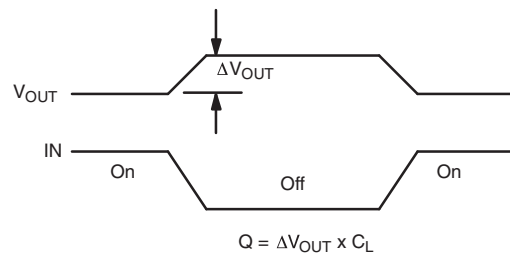
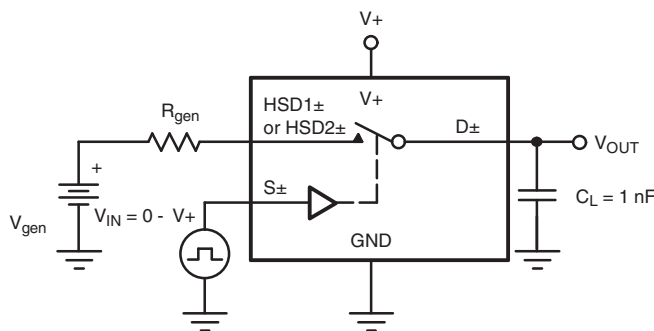


Fig. 2 - Break-Before-Make Interval



IN depends on switch configuration: input polarity determined by sense of switch.

Fig. 3 - Charge Injection

TEST CIRCUITS

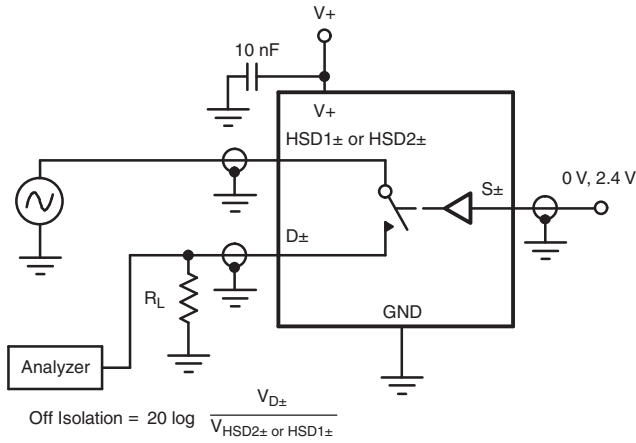


Fig. 4 - Off-Isolation

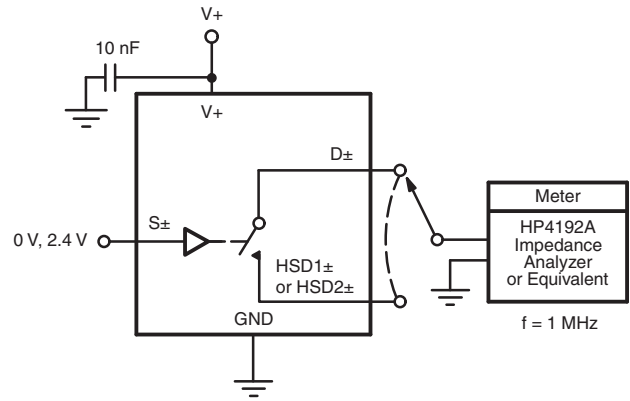
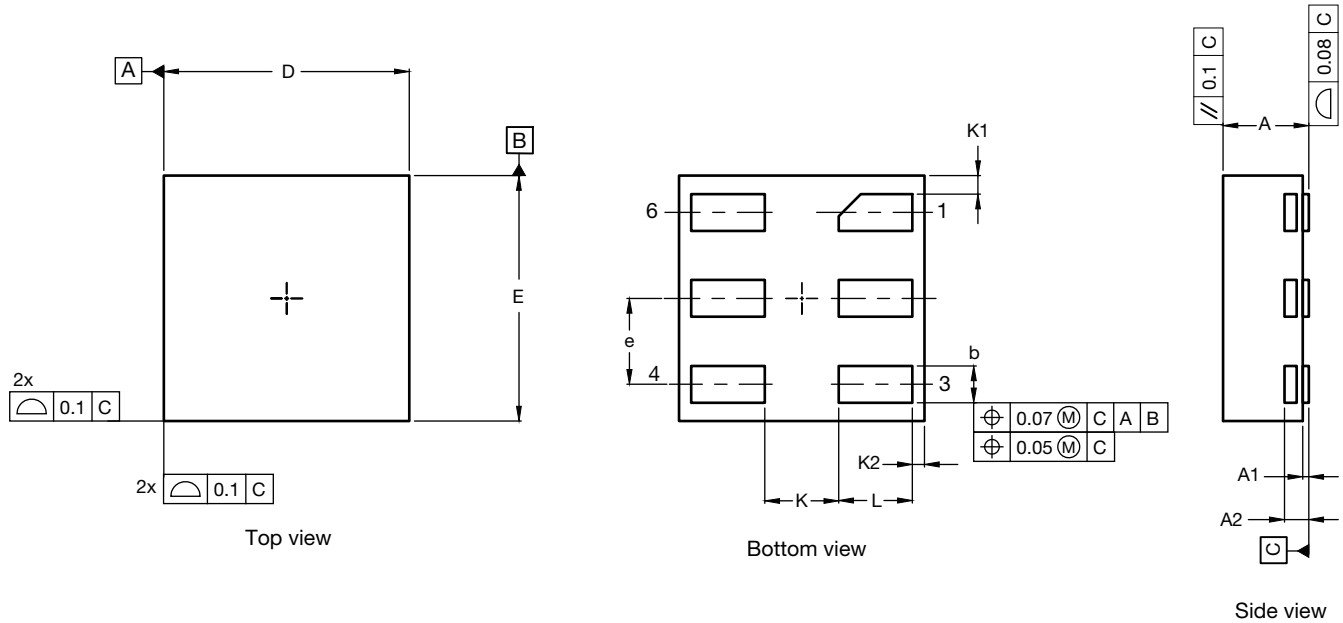


Fig. 5 - Channel Off / On Capacitance

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see www.vishay.com/ppg?75945.



μDFN-6L 1 mm x 1 mm Case Outline



| DIM. | MILLIMETERS | | | INCHES | | |
|------|-------------|------|------|------------|-------|-------|
| | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. |
| A | 0.32 | 0.35 | 0.38 | 0.013 | 0.014 | 0.015 |
| A1 | 0.00 | - | 0.05 | 0.000 | - | 0.002 |
| A2 | 0.10 Ref. | | | 0.004 Ref. | | |
| b | 0.12 | 0.15 | 0.18 | 0.005 | 0.006 | 0.007 |
| D | 0.95 | 1.00 | 1.05 | 0.037 | 0.039 | 0.041 |
| E | 0.95 | 1.00 | 1.05 | 0.037 | 0.039 | 0.041 |
| e | 0.35 BSC | | | 0.014 BSC | | |
| K | 0.30 Ref. | | | 0.012 Ref. | | |
| K1 | 0.075 Ref. | | | 0.003 Ref. | | |
| K2 | 0.05 Ref. | | | 0.002 Ref. | | |
| L | 0.27 | 0.30 | 0.33 | 0.011 | 0.012 | 0.013 |

Notes

- (1) Use millimeters as the primary measurement.
- (2) Dimensioning and tolerances conform to ASME Y14.5M-1994.
- (3) N is the number of terminals.
Nd and Ne is the number of terminals in each D and E site respectively.
- (4) Dimensions b applies to plated terminal and is measured between 0.15 mm and 0.30 mm from terminal tip.
- (5) The pin 1 identifier must be existed on the top surface of the package by using indentation mark or other feature of package body.
- (6) Package warpage max. 0.05 mm.

ECN: T16-0553-Rev. A, 26-Sep-16
 DWG: 6053



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